L-1/T-1/URP **Date: 14/01/2021**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 BURP Engineering Examinations 2019-2020

Sub: **MATH 101** (Mathematics I: Algebra Geometry and Matrix Algebra)

Full Marks: 120 Time: 2 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

Symbols used have their usual meaning.

SECTION -A

There are **FOUR** questions in this section. Answer any **THREE.**

1. (a) Consider the function: (10)

$$f(x) = \begin{cases} x+3 & if \ -2 \leq x < 1 \\ 5 & if \ x = 1 \\ -x+2, & if \ x > 1 \end{cases}$$

(i) Find the domain, (ii) Draw the curves, (iii) Find the range using graph, and (iv) Is *f(x)*continuous on its domain?

(b) Answer the following questions for the function $f(x) = 2x^2 - x - 1$ (10)

(i) If $x = -2$, what is f(x) ? What point is on the graph of f?

(ii) If $f(x) = -1$, what is x? What points are on the graph of f?

(iii) What is the domain of f?

(iv) List the x-intercepts, if any, of the graph of f?

(v) List the y-intercept, if there is one, of the graph of f?

2. (a) Sketch the graph $y = x^2 + 2x - 3$ by translation principal and verify the function symmetric or not. (10)

(b) The equations of two lines are given: $y = 4x - 4$ (5)

$$y = -4x + 2$$

Determine if the lines are parallel, perpendicular, or neither.

(c) Solve the following inequality and graph the solution set (5)

$$2x^2 < 5x + 3$$

3. (a) If $f(x) = \frac{2x-A}{x-3}$ and $f(4) = 0$, what is the value of A? Where is f not defined? (6)

(b) Determine whether the function $f(x) = \frac{2x+1}{x-1}$, $x \neq 1$ (8)

is one-to-one or not. Find the inverse and check the result.

(c) Find the domain of fog if $f(x) = \frac{1}{x+2}$ and $g(x) = \frac{4}{x-1}$. (6)

4. (a) The average cost $C^*(x)$ of manufacturing x computers per day is given by the function (12)

$$C^*(x) = 0.56x^2 - 34.39x + 1212.57 + \frac{20{,}000}{x}$$

Determine the average cost of manufacturing:

(i) 30 computers in a day

(ii) 40 computers in a day

(iii) 50 computers in a day

(iv) Graph the function $C^* = C^*(x), 0 < x \leq 80$.

(b) Sketch the graph of the following function *h(x)* and indicate the local maximum and minimum. Determine whether the function is incresig and decresing and mention the interval. Round answers two decimal places. (8)

$$h(x) = -0.2x^3 - 0.6x^2 + 4x - 6, \quad (-6,4)$$

SECTION-B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Define Hermitian, Periodic and Nilpotent matrices with examples. (8)

(b) Find the Adjoint matrix of A and hence compute the inverse of *A, where,* (12)

$$A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \\ 3 & 1 & 2 \end{bmatrix}, \text{ Also verify that } A(adjA) = |A| I_3 .$$

6. (a) Define inverse of a matrix. Write down algorithm to find inverse of a non-singular matrix using elementary row transformations. (8)

(b) Find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$ by using elementary row transformations. (12)

7. (a) Find the canonical form and hence the rank of the following matrix: (10)

$$A = \begin{bmatrix} 2 & -2 & 0 & 6 \\ 4 & 2 & 0 & 2 \\ 1 & -1 & 0 & 3 \\ 1 & -2 & 1 & 2 \end{bmatrix}$$

(b) Reduce the given matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 1 & 3 & 2 \\ 2 & 1 & 3 \end{bmatrix}$ to the normal form B and hence find the rank. (10)

8. (a) With the help of matrix, solve the system of equations: (10)

$$\begin{aligned} x_1 + 2x_2 - x_3 - 3x_4 &= 4 \\ 2x_1 + 5x_2 + 2x_3 - 4x_4 &= 6 \\ 3x_1 + 7x_2 + x_3 - 6x_4 &= 10 \end{aligned}$$

(b) Determine the values of λ and μ such that the following system of equations in unknowns x_1, x_2 and x_3 have (i) unique solution, (ii) more than one solution and (iii) no solution: (10)

$$\begin{aligned} x_1 + 2x_2 + 3x_3 &= 6 \\ x_1 + 3x_2 + 5x_3 &= 9 \\ 2x_1 + 5x_2 + \lambda x_3 &= \mu \end{aligned}$$

L-1/T-1/URP Date: 25 /01/2021

Bangladesh University of Engineering and Technology, Dhaka

L-1/T-1 B.URP. Examinations 2020

Subject: Chem123 (Basic Environmental Chemistry)

Full Marks: 180 Time: 2 hours

Figure in the margin indicate the full marks

Use separate scripts for each section and upload in the LMS system separately

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Section A

(There are **FOUR** questions in the section. Answer any **THREE**)

1a.	Illustrate the mechanism of the formation of photochemical smog in the atmosphere.	10
b.	Elucidate the characteristics of major regions in the atmospheric structure.	20
2.a	Identify the sources of NOx and explain the characteristics and biochemical effects of it. Suggest possible approaches to remove and control NOx emission:	20
b.	Briefly describe the effect of air pollution on man and his environment.	10
3a.	What are the problems associated with the use of hard water? How would you soften hard water?	15
b.	Classify different types of water pollutants.	15
4a.	Explain the origin of various organic and inorganic particulate matter in the atmosphere.	15
b.	What is greenhouse effect? "Oxygen plays a key role in the troposphere, while ozone in the stratosphere. -Justify.	15

Section B

(There are **FOUR** questions in the section. Answer any **THREE**

5a Which of the following are valid sets of quantum numbers? For a set that is invalid, explain briefly why it is not valid. 10

(i) $n = 3, l = 1, m = 0$ (ii) $n = 2, l = 1, m = 0$ (iii) $n = 5, l = 3, m = 4$.

b. How did Rutherford interpret passing of most of the alpha particles through gold foil and deflection of only a few of them during his alpha scattering experiments? 10

c. Derive an expression for angular momentum of electron using wave nature of electron. 10

6.a B and Si belong to different groups and periods, but they show similarity in properties – explain. 10

b. Arrange I, I^-, I^+ in order of increasing size. Justify your arrangement. 10

c. Which of the following ions requires maximum energy to form? Why? 10

Na^+, Ca^{2+}, K^{2+}

7a. What are the possible causes and effects of eutrophication? 10

b. Discuss oxidative and photochemical degradation processes of pesticides. List the factors which influence the degradation of pesticides? 10

c. How pollutants can be classified into different categories? Show with example. 10

8a. Discuss the health concerns about phthalate plasticizers and metal stabilizers in PVC. 10

b. What are the common properties of persistent organic pollutants? What are the reasons of banning DDT? 10

c. How Stockholm convention categorized persistent organic pollutants? What are the recommendations to general people to reduce the intake of pollutants with their daily foods? 10

L-1/T-1/ URP Date: 21/01/2021

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 BURP Examinations January 2020

Sub: **HUM 125** (English)

Full Marks: 120 Time 2 Hours

The Figures in the margin indicate full marks

USE SEPARATE SCRIPTS FOR EACH SECTION

There are 04 page(s) in this question paper.

SECTION – A

There are **FOUR** questions in this section. Answer **Q. No.1 and any TWO from the rest.**

1. Read the following passage carefully and answer all the questions that follow: (20)

Every new year, new decade, and new century brings a host of threats and unfolds a myriad of opportunities for many organizations and individuals. The year 2021 will definitely bring both threats and opportunities. Who can avail the opportunities and effectively face the threats? Only those who are capable of identifying the threats and will do homework before entering into the new year should be able to make good use of opportunities and to get around the possible threats. Some managers or entrepreneurs, being proactive in orientation, may be able to convert threats into opportunities for themselves or for their organizations. Of course, history is replete with situations when managers could not even make use of the opportunities. However, leaving aside these two extreme groups, professional managers are expected to make use of the opportunities and to get around the threats. We have already stepped into the 'Information Age.' An explosion of information technology has pervaded our home and office. Individuals and organizations are now busy in structuring their operation in this new era of information technology. Now that everyone

has an easy access to information, it has become an important input in the decision making process. The competitive edge of an organization will depend how well it has an access to information. No matter whether you are free riding on information or you are making planned investment, you have to use information to survive and to grow in the market. Thus, we are heading towards a knowledge-based society.

Questions:

a) In which context is the passage written?

b) How does the author express optimism about the new year?

c) How does the author claim that we are heading towards a 'knowledge-based society'?

d) What do we need to meet the challenges of the emerging world order?

2. Goods were assured to be delivered within two weeks of placing the order. But you have not yet received the goods. Now write a complaint letter to your supplier, pointing out the delay and specifying a date by which you wish to get the goods. (20)

3. Write an essay on any **one** of the following: (20)

a) Covid-19: Its impact on family relationships

b) Reading Books: A Habit on the Wane.

4. Describe in brief the functions of different components of a formal report. (20)

SECTION – B

There are **FOUR** questions in this section. Answer question No. **5** and any **TWO** from the rest.

5. Answer any <u>one</u> of the following questions: (20)

(a) How did the fifteen years' imprisonment change the lawyer's perception of life?

(b) Make an evaluation of the character of Mrs. Matilda Loisel.

6. (a). Explain with reference to the context any <u>one</u> of the following: (10)

i. "You have lost reason and taken wrong path, you have taken lies for truth and hideousness for beauty."

ii. "How singular is life, and how full of changes! How a small thing will ruin or save one!"

(b). Answer any <u>two</u> of the following questions: (10)

i. What was the topic of discussion among the guests at the party hosted by the banker?

ii. What impression do you get about Laura based on your study of the story 'The Garden Party'?

iii. What did the Loisel couple decide to do when they found that the necklace was lost?

7. Write a dialogue between two BUET students about the problems they are facing in their academic life on account of the outbreak of Covid -19. (20)

8. Write a precis of the following passage with a suitable title: (20)

Long ago goods were manufactured by craftsmen who were skilled workmen. A craftsman was proud of each article he made. He spent a long time in making it and took great care of its manufacture, and people paid a high price for it when it was finished. All the luxurious Persian carpets, the beautiful Chinese pottery and the hand-made lace of certain European countries were made in this way. But these articles were bought only by the rich. Poorer people had to be satisfied with the goods that were roughly and cheaply made. When the population of Europe increased, there was a demand for goods of better quality. These goods had to be produced in factories and workshops where hundreds of workers were employed. The invention of the steam engine helped manufacturers by giving them cheaper power to work their machines. Machines took the place of men. Production was increased. People were able to buy articles of good quality at low prices. The age of mass production had arrived. A 'mass' is a large number or quantity. Mass production means the manufacture of a large number of identical articles by the use of machinery. Cars, radios and cameras are the examples of many types of article that are mass-produced.

L-1/T-1/URP Date: 18/01/2021

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-1 BURP Examination, January 2020

Sub: **HUM 171** (Microeconomics)

Full Marks: 180 Time 2 Hours

The Figures in the margin indicate full marks

USE SEPARATE SCRIPTS FOR EACH SECTION

There are 03 page(s) in this question paper.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**

All the symbols have their usual meanings

Assume reasonable values for missing data.

1. (a) Describe the importance of studying elasticity of demand in Economics? (15)
Briefly explain the determinants of elasticity of demand.

(b) Given the demand function of a commodity (15)

$$Q_{dx} = 1690 - 24P_x + 0.007\ M + 3.5\ P_y$$

Where price of X, P_x = tk. 65, price of Y, P_y = tk. 75 and Income of the consumer, M = 50000. Find the income elasticity and cross-price elasticity of demand. State the implications of the results you have obtained.

2. (a) Clarify the concepts of consumer surplus and producer surplus with graphical and mathematical presentations.. (15)

(b) From the following demand and supply functions (given respectively) (15)

$$P = 36 - X^2 \text{ and } 4P - 6 = X^2$$

(The notations bear usual meanings)

Calculate consumer surplus and producer surplus.

3. (a) Evaluate the critique of the Cardinalist approach to utility analysis. Prove that consumer equilibrium condition with both the Cardinalist approach and the Ordinalist (indifference-curve) approach is identical. (30)

4 (a) Write short notes on any THREE of the following : (30)

(i) Substitution effect of a price change

(ii) Factors affecting demand for Housing in Dhaka City

(ii) Market Demand Curve

(iii) Marginal Rate of Substitution MRS.

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**

All the symbols have their usual meanings

5. (a) Distinguish between "Change in the Quantity Supplied" and "Change in Supply". (15)

(b) What is the market equilibrium? How price acts as a regulator in restoring equilibrium in the market? What is the effect on the equilibrium price and quantity if: (15)

i) Both demand and supply change in the same directions
ii) Both demand and supply change in the opposite directions

6. (a) What are the decisions of a firm in the short run and long run? Why is an average cost curve U-shaped? Explain (15)

(b) Maximize profits Π for a firm, given total revenue $R = 4000Q - 33Q^2$ and total cost (15)

$C = 2Q^3 - 3Q^2 + 400Q + 5000$, assuming $Q > 0$.

7. (a) What is perfect competition? How does a firm in perfect competition determine the profit-maximizing output level? Explain. (15)

(b) What is the shutdown point? How does a firm in competitive market decide to shutdown its production temporarily? Illustrate. (15)

8. (a) How does monopoly determine its price and output? Can monopoly sustain economic profit in the long run? (15)

(b) What is price discrimination? Using appropriate graph, explain how consumer surplus, economic profit, and output change when a monopoly practices price discrimination. (15)